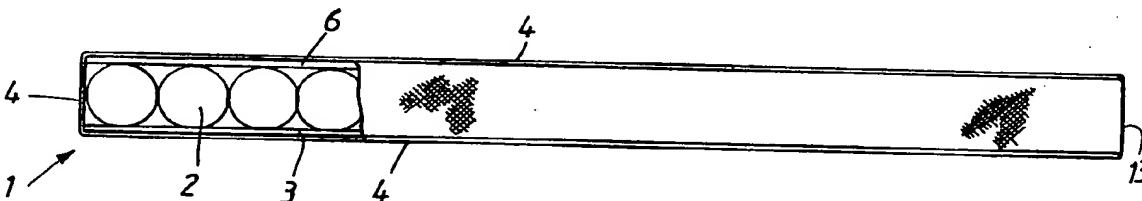




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/SE90/00686</p> <p>(22) International Filing Date: 23 October 1990 (23.10.90)</p> <p>(30) Priority data:</p> <table> <tr> <td>8903565-3</td> <td>26 October 1989 (26.10.89)</td> <td>SE</td> </tr> <tr> <td>8903811-1</td> <td>14 November 1989 (14.11.89)</td> <td>SE</td> </tr> <tr> <td>9002515-6</td> <td>27 July 1990 (27.07.90)</td> <td>SE</td> </tr> </table> <p>(71) Applicant (for all designated States except US): TOOLING PROMOTION AB [SE/SE]; Vasaplatsen 1, S-411 76 Göteborg (SE).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only) : PETERSSON, Bengt [SE/SE]; Stutaliden 33, S-434 00 Kungsbacka (SE).</p> <p>(74) Agents: GRAUDUMS, Valdis et al.; Albihn West AB, Box 142, S-401 22 Göteborg (SE).</p>		8903565-3	26 October 1989 (26.10.89)	SE	8903811-1	14 November 1989 (14.11.89)	SE	9002515-6	27 July 1990 (27.07.90)	SE	<p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published With international search report. In English translation (filed in Swedish).</p>	
8903565-3	26 October 1989 (26.10.89)	SE										
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9002515-6	27 July 1990 (27.07.90)	SE										
<p>(54) Title: MATTRESS, CUSHION, AND THE LIKE</p> 												
<p>(57) Abstract</p> <p>The present invention relates to a mattress, cushion or similar which comprises a plurality of fillable elements (2) where the pressure in each element can be individually regulated in a flexible manner, since the mattress consists of a large number of non-communicating such units (2).</p>												

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MATTRESS, CUSHION, AND THE LIKE

Technical field

The present invention relates to a cushion, mattress or similar which comprises a plurality of fillable elements, according to the preamble of claim 1. The invention accordingly relates to contrivances comprising a plurality of fillable elements (for example inflatable) which are not in communication with each other.

Background arts and problems

Nowadays on the market there are mattresses and also beds which consist of fillable elements, for example air mattresses and water beds. These presents a first disadvantage in that because of a too small number of such closed volumes, it is not possible to finely adjust the pressure so that it be optimally adapted to each part of the body. A further, and important, disadvantage is that such mattresses are not ventilated, but are instead "sealed".

Other known mattresses, i.e. spring mattresses, do not display the above mentioned disadvantages. Such a mattress can thus be individually adapted for each part of the body and can "breathe". On the other hand, such a mattress is volumous and therefore expensive to transport.

Solution and advantages

A first object of the present invention is to provide a mattress which combines the positive properties of the above mentioned known mattresses and which eliminates the disadvantages which are present in connection with these above mentioned known mattresses.

Said object is achieved by means of a contrivance according to the present invention whose features are given in the following claim 1.

A further object of the present invention is to provide a seat-cushion, mattress or similar which overcomes one of the problems that previously known, non-communicating fillable elements display, that being that they are relatively unyielding.

The invention further relates to the provision of a bed which includes a mattress according to claim 1.

Brief description of the drawings

The invention will be clarified in the following by way of example only with reference to the attached drawings in which;

- Fig. 1 shows a mattress according to the invention seen from the side and partially sectioned,
- Fig. 2 shows the same mattress seen from above and also partially sectioned,
- Fig. 3 shows a bed according to the invention, partially sectioned and seen from the side, and
- Fig. 4 shows the same bed seen from above, also partially sectioned.
- Fig. 5 shows a preferred bed according to the invention seen from the side, partially sectioned,
- Fig. 6 shows the inner construction of a bed according to figure 5,
- Fig. 7 schematically shows various possible profiles of fillable elements in accordance with the invention and
- Fig. 8 shows an alternative embodiment of a bed according to the invention, seen from above.

Accordingly, in figure 1 a mattress is shown which is filled with a quantity of fillable elements 2. In the preferred

instance, these elements 2 are formed as balls, these being spherical and air-filled.

The elements 2 can, however, be filled with other mediums, such as water, and have a different shape, for example cylindrical. Their height, length and breadth are preferably approximately the same and essentially correspond to the height of the mattress.

The elements 2 are inserted between two sheet-like perforated elements 3, 6 which are held in place with the aid of an enveloping cover 4. The mattress is suitably provided with a closable opening 13 in the one end where the inflatable balls 2 can be inserted.

In figure 2 the same mattress is shown, seen from above and partially sectioned. It can be seen how the balls 2 are closely packed together between both the sheets 3, 6. The sheets 6 are suitably made from an air-permeable polymer material, such as polyester. The sheets 3, 6 are appropriately sewn to the enveloping cover 4 with the aid of seams 5 which are preferably arranged in accordance with a decorative pattern.

A bed is shown in figure 3 which is made in accordance with the invention. The bed stands on legs 11 and has a mattress part which principally consists of inflatable balls 2. These inflatable balls are placed between ribs 8, which are evenly distributed along (or across) the bed. In order to hold the elements 2 in position in the length- and width-directions, the bed gables 9, 10 are provided with such a height that they hold the elements 2 in place. The bed gables 9, 10 are suitably provided with means (not shown) so that they can easily be joined and also have suitable means for easily connecting the ribs 8 thereto. Figs. 3 and 4 further show that the mattress elements 2 are covered by a layer 3 which is perforated and which in turn is covered by a cover 4. This cover 4 is attached in a simple manner to the bed, suitably on the under surface of the bed gables 9, 10, preferably with the help of VELCRO

fasteners 7. In figure 3 it is further shown that an additional mattress 12 can advantageously be used on the bed.

Delivery of the bed can take place with the taking up of a very small volume. The inflatable elements 2 are in a non-filled condition and accordingly require very little space. The ribs 8 and the bed gables 9, 10 can be closely packed together and the cover 4 and the support layer 3 can be wrapped around these. In other words, the volume which such a package takes up is very small in comparison to that which a normal bed occupies. In the same way, the mattress which is shown in Figs. 1 and 2 occupies a very small space in its inactive, deflated state. The space requirement is accordingly comparable with a normal air mattress.

As already stated, the elements 2 are suitably filled with air. This can be achieved in several ways, for example via particular valve arrangements of a known type (such as for balls, bicycle inner-tubes, rubber-rings, etc). Another alternative is to design the interior of the elements to be "self-sealing". During inflation, a needle is thus able to penetrate the one wall through which air is pumped in and when the desired pressure has been reached, the needle is simply withdrawn. The pressure within the element 2 is maintained thanks to the self-sealing properties of the inner wall.

When the balls 2 are packed together to form the mattress, a cavity is created between "each four" balls which implies that the mattress can breath. By using upright cylindrical elements 2, the size of each individual cavity can be regulated independent of the height of the mattress.

In order to obtain optimal pressure distribution in the mattress, the elements 2 are suitably divided into different pressure categories by means of visual markings, and are set out in accordance with a predetermined pattern. The markings can for example be provided by giving different colours to the containers 2 which are to be filled with different pressures.

When the variously coloured elements 2 have been filled with the respective recommended pressures, they are suitably set out in accordance with an enclosed map. The optimal pressure in each individual container 2 is of course related to the individual's body constitution. Accordingly, there should be different pressure recommendations for different types of bodies. The principle does however permit the individual adaptation of a different pressure in various sections of the mattress, to a predetermined optimal pattern which, suitably through medical research, has been shown to be the most favourable for that type of body, in particular to avoid back complaints.

A further finesse with the invention is that the pressure distribution in the mattress can be varied as needed. Accordingly, it is possible to adapt the pressure and distribution in the mattress to a new optimal pattern if the person's body constitution, after a time, should greatly change, for example after a successful diet which leads to a considerable weight loss.

Figure 5 accordingly shows a bed which is filled with a quantity of fillable elements 2. In the preferred case these elements are filled with air and shaped in accordance with that shown in figure 7a. The elements 2 are inserted between two sheet-like, preferably perforated elements 3, 6 which are held in place by means of one at least partially enveloping cover 4. To position the elements 2 in an upright state and at a certain distance from each other, a net-like support unit 13 is provided. This unit 13 thus has the function of positioning the elements 2.

In certain cases it may be necessary that two such units are required to maintain the elements 2 in the upright state. A further possibility is to make use of support plates, as shown by figure reference number 14 in figure 6.

The material of the support unit 13 is suitably such that it is flexible but not stretchable. It should not be stretchable so that it can guarantee positioning, and it should be flexible so that it can be compressed (rolled, folded, etc) during packing and transport. Accordingly, a suitable material is a fibre reinforced polymer.

In accordance with the invention, each element 2 is shaped in such a way that good springing is achieved. This is possible by having a region 21 with continuously increasing cross-sectional area, suitably by being conically shaped.

Such an element 2 is shown in figure 6a and whose lower end is formed with a conical region 21. Within this conical region 21, two cross-sectional planes 23, 24 have been schematically drawn. When a force is applied in the direction of arrow A, the element will present a progressive springing effect. This can be clearly seen from figure 2a since compression up to the first partial surface 23 only concerns a very small partial volume whilst a considerably larger partial volume in relation to this must be compressed in order to press up to the second cross-sectional surface. Accordingly, thanks to this, a progressive opposing spring force is achieved since the compression force is proportional to the compressed volume, and thus the resistive force during compression to the second partial plane 24 considerable exceeds that which corresponds to a compression to the first plane 23.

In order to achieve said desired spring properties of a partial element 2, it is possible to form them with a plurality of different cross-sectional shapes. Some such possible forms are exemplified in figure 3, and shown in profile, i.e. through the vertical line, presuming that the elements are standing upright. Consequently, figure 3a shows an embodiment in accordance with that which is already exemplified in figures 5 and 2. Figure 7b shows that the conical region does not necessarily have to be located at the one end (or possibly at the top), but can also be located anywhere along the central

section of the element 2. In figure 7c it is shown that two opposed conical regions can also be used which can give a further increased spring component. In figure 7d it is shown that the element can be formed with other than straight-lined regions, in this case being completely elliptically shaped. It is, however, necessary that the longitudinal extension of the element (X-axis = vertical line) exceeds the width (Y-axis) of the element in order to achieve the sought after spring action in each element.

Naturally, elements having different configurations can be mixed and used together with one and the same base. Furthermore, it is of course possible to arrange this non-linear, continuously increasing surface (3d) at an element's mid-section, in accordance with that which is shown in the figures 3b and 3c. It is further foreseen that straight-lined sections of the element 2 can be combined with non-straight lined sectors.

A modified version for a mattress for a bed in accordance with the present invention is shown in figure 8. The bed which stands on legs 11, hereby comprises gables 9, 10 which delimit the bed's transverse extension, and a base in the form of ribs 8. In this modified version it is not necessary to make use of a frame unit, since the elements can be held in place with the help of the base 8 and the transversely delimiting gables 9, 10. Consequently, in this case the elements 2 are tightly packed against each other so that they are maintained in the predetermined vertical position.

The tightly packed elements 2 which are shown in figure 8 can also be obtained in accordance with the preferred embodiment, i.e. with the simultaneous use of a support element 13 according to the above. The elements must therefore have a principal shape in accordance with that shown in figures 7b and c, whereby the recess which is formed by the conical region creates space for the support element 13. Additionally, the width of the support element 13 preferably should not exceed

twice the depth of the recess. Such an arrangement also has the advantage that the elements can be pre-fixed in predetermined locations. This fixing can be a problem if the first described method according to figure 8 is applied.

In figure 9 a partial view of a preferred embodiment of a mattress in accordance with the invention is shown. The fillable elements are inserted between a mattress base 8 and an upper sheet 3 (the surrounding cover is not shown). Each element 2 consists of two PVC-sections welded together along an encircling seam 21. In the preferred case, each section is circular and has a diameter which exceeds 200 millimeters, preferably approximately 600 millimeters. Each element further presents a valve 22 of a conventional non-return type. For ultimate comfort, the elements are only partially filled, preferably approximately half filled, which for an element of the 600 millimeter type implies a height of approximately 100-120 millimeters. If it is desired that a part of the body lies higher, for example the head, the elements at the head end are filled somewhat more so that each element is inflated to a higher height, for example approximately 200 mm. The half filled elements 2 are packed so that they overlap somewhat, in accordance with the figure.

The invention is not restricted to the above shown. It would for example be possible to vary the length of each individual element 2 until, in their widest condition, it is the same length as the mattress's width. In spite of this, in order to maintain "breathing", such an extended element 2 must either be provided with holes or be wave-shaped, i.e. with various diameters. Additionally it would also be possible to combine elements of the latter mentioned type with balls in one mattress.

In terms of the sheet-like elements 3, 6, on the one hand it is possible that they can dispense with totally. On the other hand there is an alternative to perforation in order to give them the air permeability, for example by using material which

"breathes". The lower sheet does not need to be able to "breathe" if the ventilation through the sides of the mattress is good enough. Additionally, it is foreseen that the enclosing cover 4 can be exchanged for another suitable means, for example a net. This means 4, like the cover, can advantageously be elastic.

The partial elements 2 do not of course need to present the circular cross-sectional surface as shown, but can vary therefrom, by being for example quadratic, oval, etc. In the extreme case it is imaginable that each partial section 2 extends across the whole mattress in the transverse direction, i.e. each element presents an extremely rectangular form. The support piece 13, in such a case, does not have a net-like structure as shown, having almost quadratic partial surfaces, but instead has extremely rectangular partial surfaces where the transverse extension considerably exceeds the widthwise extension. Furthermore, a cushion according to the invention can advantageously be arranged on top of a mattress/base according to the invention, for example on a sofa, in order to obtain an even softer springing.

Claims

1. Mattress, cushion or similar comprising a plurality of non-communicating fillable elements (2), characterized in that the elements (2) are maintained in predetermined positions with the aid of a surrounding means (4); (4, 8, 9, 10).
2. Mattress, cushion or similar according to claim 1, characterized in that the height of the mattress substantially corresponds with the element's (2) extension in that direction, corresponding to the x-axis in a three-dimensional coordinate system where the z-axis corresponds to the mattress's transverse extension and the y-axis corresponds to the mattress's longitudinal extension, and preferably that its (2) extension along the y-axis substantially corresponds to the extension along the z-axis and further, preferably, that the element's (2) extension in the x-, y- and z-axis substantially correspond.
3. Mattress, cushion or similar according to claim 2, characterized in that the element's (2) extension along the z-axis is less than or the same as the mattress's width.
4. Mattress, cushion or similar according to claim 1, characterized in that said surrounding means is substantially thin and flexible (3, 4, 6).
5. Mattress, cushion or similar according to claim 2, characterized in that the mattress (1) comprises two flexible sheets (3, 6) which are parallel with the mattress's principal plane of extension and which sheets (3, 6) are placed one on either side of said elements (2) and

further that at least one of said sheets is at least partially air-permeable, whereby said sheets preferably are sewn together (5) with a surrounding cover (4).

6. Mattress according to claim 1, characterized in that it forms a part of a bed and that said surrounding means is partially made from a thin walled flexible region (3, 4) and a substantially rigid base region (8, 9, 10), whereby each element (2) is preferably maintained in its upright position with the aid of an enclosing frame (9, 10) within which the elements (2) are tightly packed.

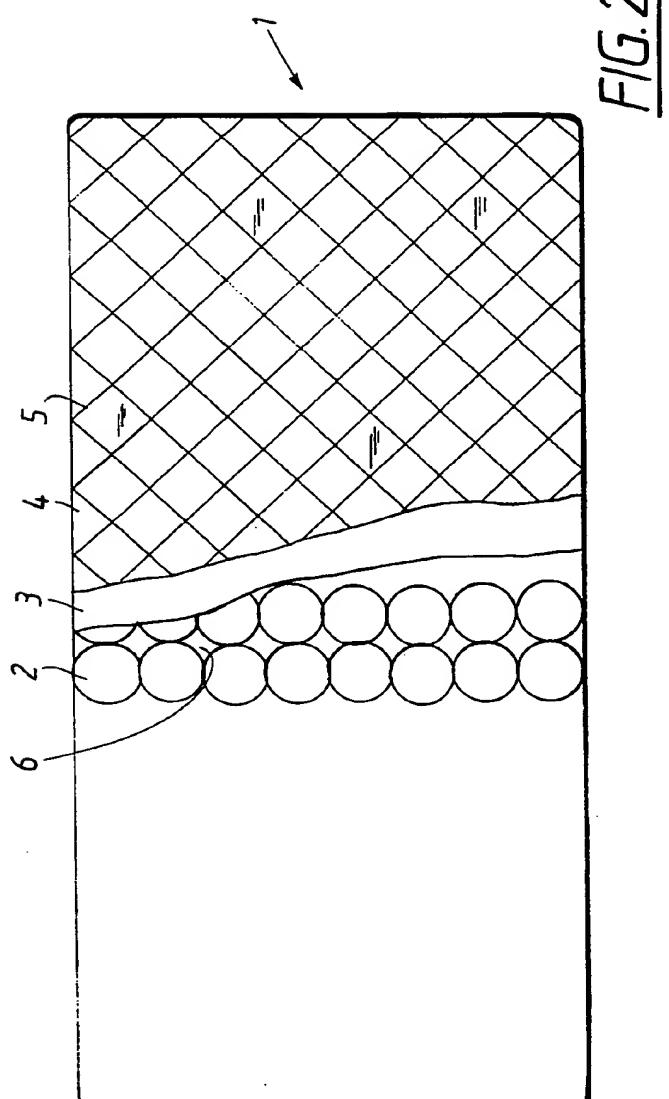
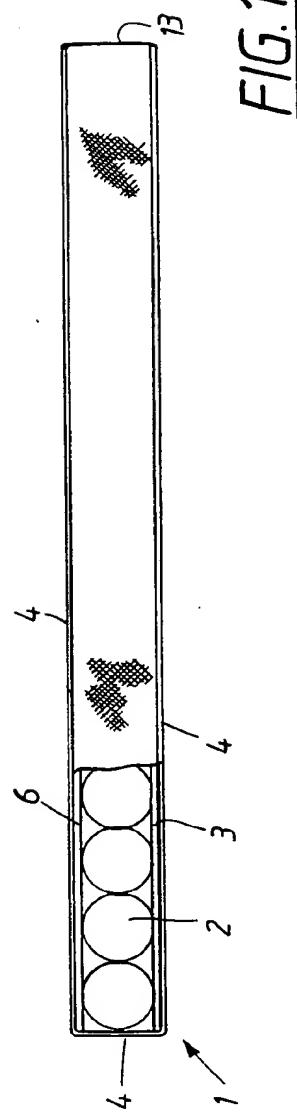
7. Mattress, seat-cushion or similar according to claim 1, characterized in that at least a plurality of these elements (2) have a longitudinal extension which exceeds the element's width in at least one transverse direction, and that the element's longitudinal extension substantially equals the imaginary vertical line and that preferably each such element (2) displays a region (21) with a continuously increasing, respectively decreasing, cross-sectional surface.

8. Mattress, seat-cushion or similar according to claim 7, characterized in that the elements (2) are maintained in position with the help of a support unit (13) which preferably surrounds each element, whereby the support element preferably comprises a suitable fibre-reinforced polymer.

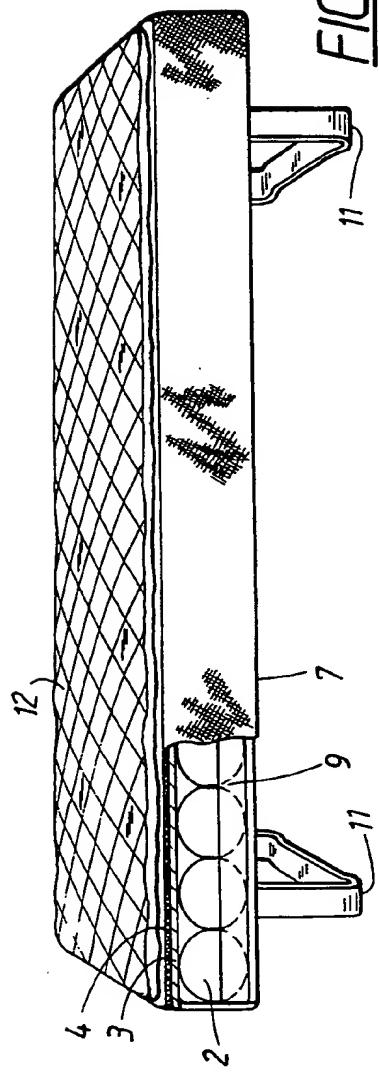
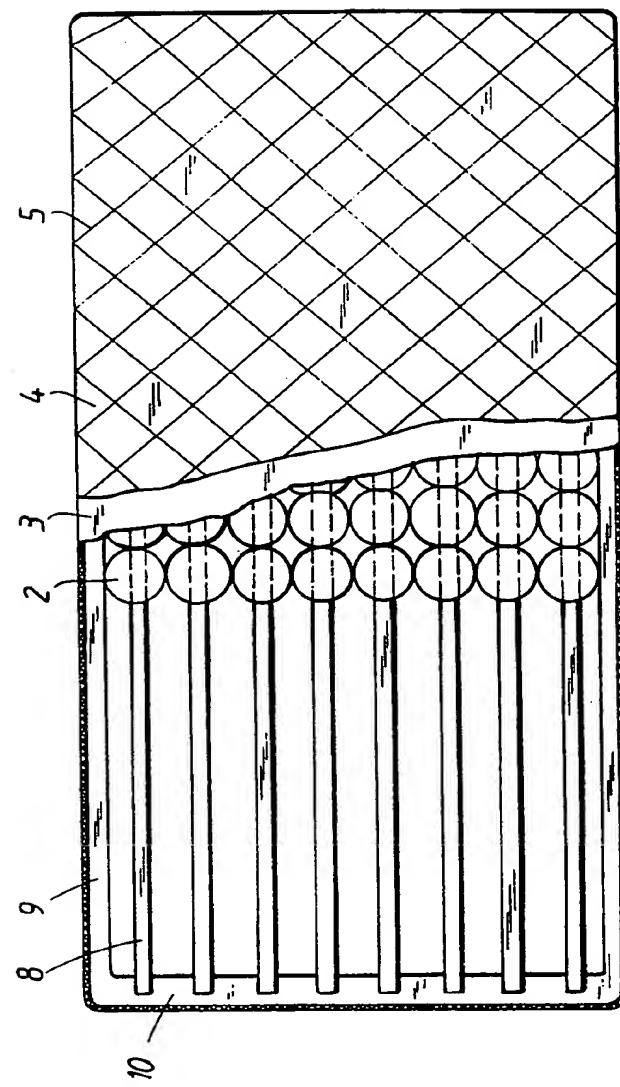
9. Mattress, seat-cushion or similar according to claim 7, characterized in that said region (21), with a continuously increasing cross-sectional surface is conically shaped, whereby the conicity at said region (21) is preferably constant.

10. Mattress, seat-cushion or similar according to claim 7, characterized in that each such element (2) also in a second transverse direction has a width less than said longitudinal extension.

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FIG. 3FIG. 4

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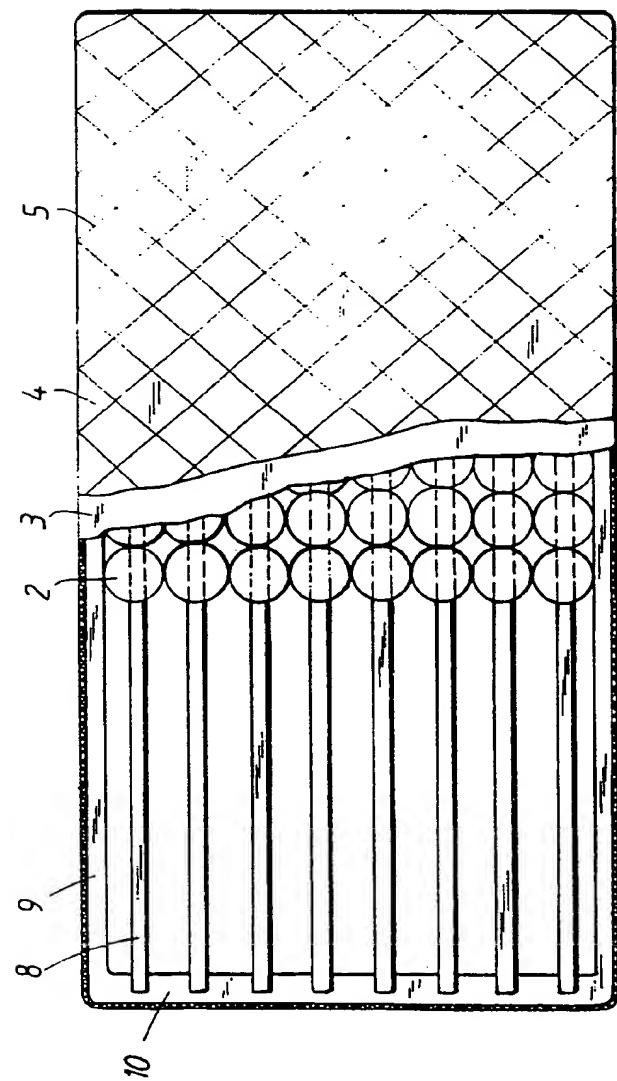
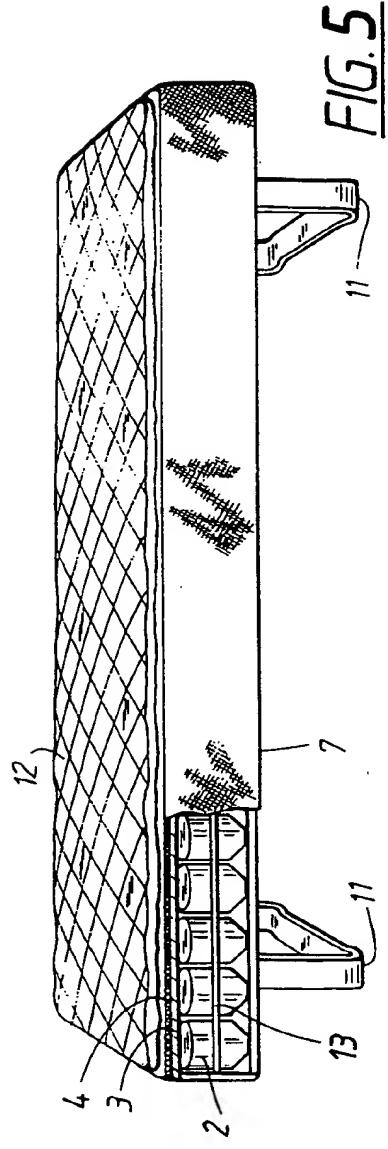


FIG. 8

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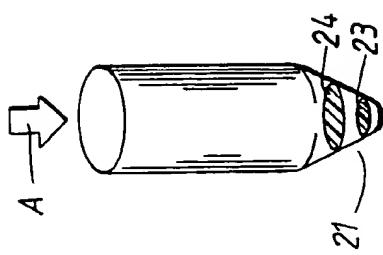


FIG. 6a

FIG. 7

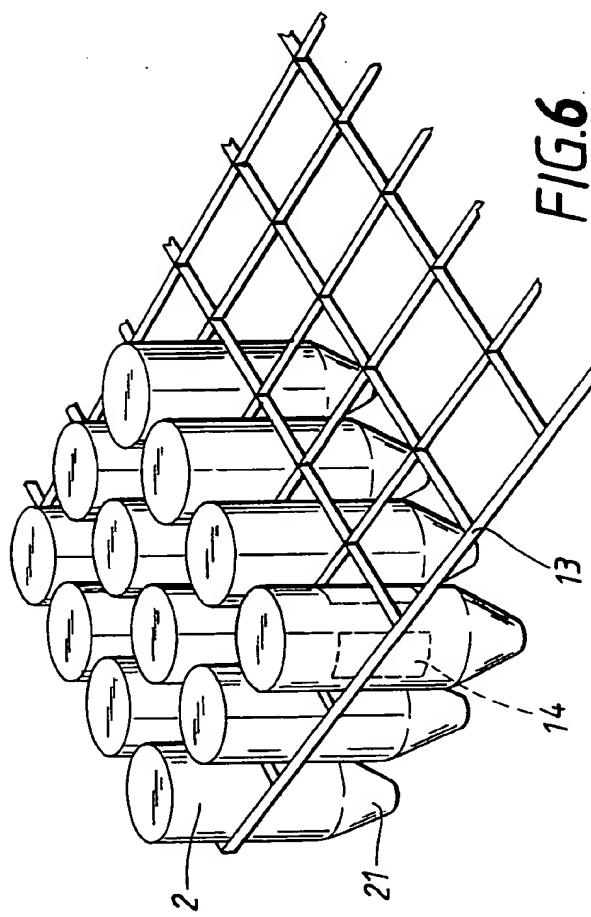
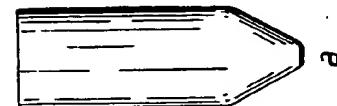
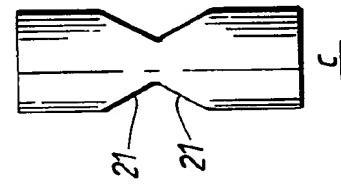
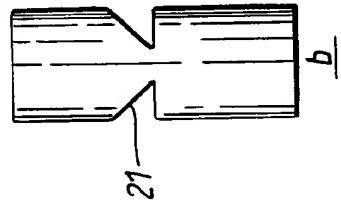
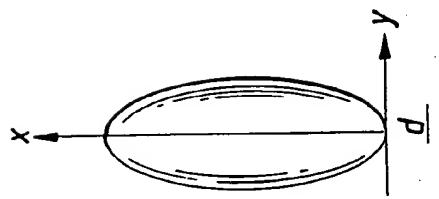


FIG. 6



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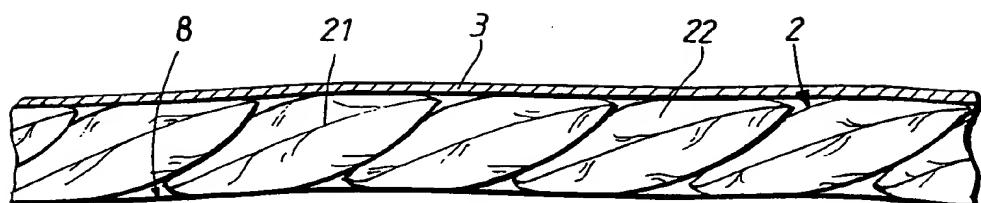


FIG. 9

INTERNATIONAL SEARCH REPORT

International Application No. PCT/SE 90/00686

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC
IPC5: A 47 C 27/10//A 47 C 4/54

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System	Classification Symbols
IPC5	A 47 C

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in Fields Searched⁸

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	US, A, 2415150 (M. R. STEIN) 4 February 1947, see figures 14-17 --	1-5,7, 10
X	US, A, 4542547 (HISASHI SATO) 24 September 1985, see figures 3,4 --	1-7
X	DE, A, 2221725 (FA. ROBERT KAHL) 15 November 1973, see page 5, line 5 - line 12 --	1-5,7,9, 10
X	DE, A, 3303615 (HOBENSIEFKEN, GEROLD) 9 August 1984, see page 3, line 10 - line 17 --	1-5,7- 10

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
16th January 1991	1991-01-18
International Searching Authority	Signature of Authorized Officer <i>Nils Andersson</i> Nils Andersson

SWEDISH PATENT OFFICE

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	DE, C, 3602173 (SIMSON, JOCHEN ET AL) 29 October 1987, see the whole document ----- -----	1-5,7- 10

Form PCT/ISA/210 (extra sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 90/00686

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 90-11-28
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A- 2415150	47-02-04	NONE		
US-A- 4542547	85-09-24	JP-A- 59080552 SE-C- 458584 SE-A- 8306879		84-05-10 89-08-10 84-06-16
DE-A- 2221725	73-11-15	NONE		
DE-A- 3303615	84-08-09	NONE		
DE-C- 3602173	87-10-29	EP-A- 0231144 JP-A- 62217905 US-A- 4750224		87-08-05 87-09-25 88-06-14

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